

REMARKS

In response to the Office Action mailed April 4, 2006, the Applicants respectfully request reconsideration. To further the prosecution of this Application, the Applicants submit the following remarks, have cancelled claims, and have added new claims. The claims as now presented are believed to be in allowable condition.

Claims 1-7, 9, 26-28, 33, and 34 were pending in this Application. By this Amendment, claim 4 has been cancelled and claim 1 amended to include the content of cancelled claim 4. Also by this Amendment, claim 28 has been cancelled and claim 26 amended to include the content of cancelled claim 28. Claims 35-43 have been added. Accordingly, claims 1-3, 5-7, 9, 26, 27, 33, and 34-43 are now pending in this Application. Claims 1 and 26 are independent claims.

Rejections under §102 and §103

Claims 1 and 26 were rejected under 35 U.S.C. §102(a) as being anticipated by U.S. Patent No. 6,622,905 to Shier et al., hereinafter Shier. Claims 1-3, 6, 7, 9, and 26-28 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,389,691 to Rinne et al., hereinafter Rinne. Claims 1-3, 6, 9, and 26, 27, 33, and 34 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,324,754 to DiStefano et al., hereinafter DiStefano. Claims 4, 5, and 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Rinne in view of U.S. Patent Publication No. US2001/0011676 A1 to Regner et al., hereinafter Regner.

The Applicants respectfully traverse the rejections of claims 4 and 28 and request reconsideration. The claims are in allowable condition.

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Claim 1 has been amended to include the content of cancelled claim 4. The rejection of claim 4 is addressed below.

As amended, the Applicant's claim 1 relates to a method for processing a circuit board. The method includes placing a mask layer on the circuit board, the mask layer defining a set of pad profiles for a component mounting location where each pad profile of the set of pad profiles has a set of rounded corners. The method further includes forming, for each pad profile of the set of pad profiles, a soldering pad having a set of radii corresponding to the set of rounded corners of that pad profile to create a set of soldering pads for the component mounting location where each soldering pad having the set of radii being configured for a high bond strength solder joint. When forming, the method includes etching, as the soldering pad, a surface mount contact having a main portion, and multiple convex lobes integrated with the main portion. The method further includes removing the mask layer from the circuit board. After removing the mask layer from the circuit board, the method further includes printing solder paste on a top surface of each soldering pad of the set of soldering pads while leaving a periphery of the top surface of each soldering pad of the set of soldering pads exposed, placing a circuit board component in contact with the printed solder paste, and applying heat to solder the circuit board component to the set of soldering pads using the printed solder paste.

The Office Action rejected claim 4 under 35 U.S.C. §103(a) as being unpatentable over Rinne in view of Regner. However, neither reference alone or in combination teaches or suggests all of elements of amended claim 1. For example, neither Rinne nor Regner teaches or suggests "printing solder paste on a top surface of each soldering pad of the set of soldering pads while leaving a periphery of the top surface of each soldering pad of the set of soldering pads exposed" as claimed by the Applicants.

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Rinne relates to the field of microelectronic devices. Rinne recites a microelectronic structure 11 having a contact pad 14 and a passivation layer 12. An under bump metallurgy layer 16 is formed on the passivation layer 12 to provide a connection between a solder bump 21 and the contact pad 14. Column 6, lines 15-18. The solder bump 21 includes an enlarged width solder portion 22A and an elongate solder portion 22B disposed on respective under bump metallurgy layer 16A, 16B. Column 5, lines 27-31. Rinne, however, does not teach or suggest printing solder paste on a soldering pad while leaving a periphery of the top surface of each soldering pad exposed, as claimed by the Applicants. As shown in Fig. 5 in Rinne, the under bump metallurgy layer 16 and solder portions 22A, 22B extend across the entire surface of the pad and, therefore, do not leave the periphery of the top surface of the pad exposed.

Furthermore, Renger does not cure the deficiencies of Rinne.

Regner relates to a solder stencil 10 for applying solder paste to a pad on a printed circuit board. The stencil 10 includes a hole pattern represented by two holes 12, 14 having a generally rectangular shape with facing edges having a concave configuration. Paragraph 0020. As shown in Fig. 3 deposited paste does not cover the bond pad 18 but a concave exposed area 22 remains. Paragraph 0026. The purpose of the exposed area is to prevent the formation of solder balls that are formed away from the main solder pool during reflow. Regner however does not teach or suggest printing solder paste on a soldering pad while leaving a periphery of the top surface of each soldering pad exposed, as claimed by the Applicants. In Regner, after the printing process, only one edge of the pad is free from solder paste.

For the reasons stated above, claim 1 patentably distinguishes over the cited prior art, and the rejection of claim 1 under 35 U.S.C. §103(a) should be withdrawn. Accordingly, amended claim 1 is in allowable condition. Because

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claims 2, 3, 5-7, 9, and 33 depend from and further limit claim 1, claims 2, 3, 5-7, 9, and 33 are in allowable condition for at least the same reasons.

Claim 26 has been amended to include the content of cancelled claim 28. The rejection of claim 28 is addressed below.

Claim 26 as amended relates to a method for processing a circuit board. The method includes providing a circuit board, forming a set of pads on the circuit board, and placing a solder mask layer over the formed set of pads. The solder mask defines a set of solder apertures for the set of pads, each solder aperture of the set of solder apertures having a set of rounded corners configured for a high bond strength solder joint. Each pad is solder mask defined and has at least one solder mask defined straight edge and at least two solder mask defined radii. In the method, the step of placing the solder mask layer includes creating a set of surface mount contacts, each surface mount contact having a main portion, and multiple convex lobes integrated with the main portion. The method also includes printing solder paste substantially consisting of flux and substantially lead-free solder over the set of pads and soldering a component to the set of pads using the printed solder paste.

The Office Action rejected independent claim 26 under 35 U.S.C. §102(b) as being anticipated by Rinne. As recited above, the solder bump 21 of Rinne includes an enlarged width solder portion 22A and an elongate solder portion 22B disposed on respective under bump metallurgy layer 16A, 16B. Column 5, lines 27-31. The raised solder bump of Rinne can be used to connect the microelectronic substrate, both electrically and mechanically, to a printed circuit board or other next level packaging substrate. Column 4, lines 16-20.

Rinne does not anticipate claim 26 as amended because Rinne does not teach or suggest all of the elements of claim 26. For example, Rinne does not

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teach or suggest providing a circuit board, forming a set of pads on the circuit board, or soldering a component to the set of pads using the printed solder paste, as claimed by the Applicants. As indicated above, Rinne relates to the field of microelectronic devices. In Rinne, the microelectronic structure 11 includes substrate having a solder bump that allows the microelectronic substrate to couple to a printed circuit board or to another substrate. There is no teaching or suggestion in Rinne that the substrate is a circuit board as claimed by the Applicants. Furthermore, there is no suggestion in Rinne of soldering a component to the set of pads, as claimed by the Applicant. Rinne merely describes the solder bump as being used to connect the microelectronic substrate to a printed circuit board or another packaging substrate.

Additionally, there is no motivation to combine Rinne with Regner to achieve the Applicants' method as recited in claim 26. As indicated above, Rinne describes a microelectronic structure that includes a substrate having a solder bump that allows the microelectronic substrate to couple to a printed circuit board or to another substrate. Also as indicated above, Regner relates to a solder stencil for applying solder paste to a pad on a printed circuit board. Because there is no teaching or suggestion in Rinne that the microelectronic substrate is a circuit board, there is no motivation to utilize the printed circuit board stencil of Regner to apply solder paste to the under bump metallurgy layer on the microelectronic substrate of Rinne.

For the reasons stated above, claim 26 patentably distinguishes over the cited prior art, and the rejection of claim 26 under 35 U.S.C. §102(b) should be withdrawn. Accordingly, claim 26 is in allowable condition. Because claims 27 and 34 depend from and further limit claim 26 claims 27 and 34 are in allowable condition for at least the same reasons.

Newly Added Claims

Claims 35-43 have been added and are believed to be in allowable condition. Claims 35-37, 40, and 41 depend from claim 1 and claims 38, 39, 42, and 43 depend from claim 26. Support for claims 35 and 38 is provided within the Specification, for example, on page 17, lines 17-28. Support for claim 36 is provided within the Specification, for example, in Figs. 7 and 8. Support for claims 37 and 39 is provided within the Specification, for example, in Fig. 6. Support for claims 40-43 is provided within the Specification, for example, on page 14, lines 3-15 and in Fig. 2. No new matter has been added.

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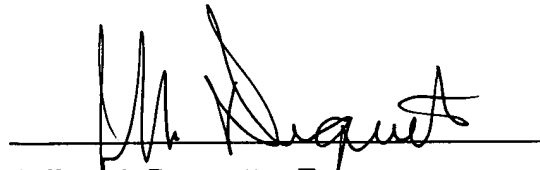
Conclusion

In view of the foregoing remarks, this Application should be in condition for allowance. A Notice to this affect is respectfully requested. If the Examiner believes, after this Amendment, that the Application is not in condition for allowance, the Examiner is respectfully requested to call the Applicants' Representative at the number below.

The Applicants hereby petition for any extension of time which is required to maintain the pendency of this case. If there is a fee occasioned by this Amendment, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50-3661.

If the enclosed papers or fees are considered incomplete, the Patent Office is respectfully requested to contact the undersigned collect at (508) 616-2900, in Westborough, Massachusetts.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Jeffrey J. Duquette", is written over a horizontal line.

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Attorney Docket No.: EMC03-11

Dated: July 5, 2006